IoT Based Gas Leakage Detection and Alert Generation Using Raspberry Pi

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Publication Info

Article history:
Received : 10 February 2020
Accepted : 15 May 2020

Keywords:
GSM, LCD, LPG, PPM, MQ2 photoelectric cell, Thingspeak, VNC.

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Abstract

This paper deals with the improvement of an advancement development gas sensor for distinguishing proof, checking and control course of action of LPG spillage. Nowadays the use of the gas is extended the gas spillage has been a famous issue. The gas spillage causes the wastage of the gas and mainly as its combustible veritable can harm the living thing and other property. To beat such a scene, we are developing a system by using raspberry pi. This will prompt the customer about the spillage and take the security measures in a brief moment. The chance of the system is that the gas sensor is used, which recognizes the closeness on the gas in the including atmosphere and if the estimation of the gas in air is extended, by then the structure and the structure make the breaking point regard alert can be watched and controlled remotely. A Web page is worked to demonstrate the status to the client observing it.

1. INTRODUCTION

The IoT makes tasks less complex via computerizing each little work around us. IoT helps extensively in modernizing endeavors; its upsides can, in like manner be loosened up for improving the present security models. IoT is a growing system of physical gadgets that are connected with various kinds of sensors, and with the assistance of a network to the web, they can trade information. Advanced cells are making new period by making correspondence between various machines utilizing Wi-Fi module, Thing Speak cloud and its services. LPG is starting at now the purposely utilized gas in our home for cooking purposes. This paper exhibits a LPG spillage location and ready framework to maintain a strategic distance from fire mishaps and to give house wellbeing utilizing IoT and raspberry pi.[1-3]

2. RELATED WORK

Hinaruksar, Chandana R, Nandini [4] have stated a framework that, alongside observing and recognizing gas spillage, continuous information is made accessible through ongoing feed over web. All have utilized Xively IOT stage to give constant sensor information over the web. In paper by Ashish Shrivastava, RatneshPrabhaker [5] intends to introduce a plan that distinguishes gas spillage and alarms and mood killer fundamental force and gas supplies. It alarms by sending SMS along with the assistance of GSM module.

AsmitaVarma, Prabhakar S, KayalvizhiJayavel [6] have stated the gas spillage identifier framework, which utilizes IOT innovation, which likewise has smart cautionary procedures such as calling, sending text messages and emailing to the authority concerned. The system also cuts the house or building's essential supply of force through transfers when gas grouping arrives at a lower blast cap. The system sends the sensor readings to the cloud to allow for an inspection.

3. REQUIREMENTS ANALYSIS

The approach suggested is a block diagram, a flowchart, and a complete description of the designed system.

3.1. Hardware Requirements

3.1.1. Power Supply

Force supply is given to Raspberry Pi through a miniaturized scale USB plug: a 1Amp cell charger functions admirably; however, to utilize a USB hard drive, 2 Amp power is required. This equivalent stockpile is utilized by all sensors associated with Raspberry Pi too by LCD utilized in the framework.

3.1.2. Raspberry Pi 3

The Raspberry pi 3 is a single-board PC utilized in the proposed framework to control the different sensors through its GPIO pins. These pins are used for Raspberry Pi and

gadgets appended to it. These pins go about as information pin or yield pin. Raspberry Pi 3 Model B has 26 GPIO sticks out of absolute 40 pins. Different pins are utilized for force and ground. The Raspberry Pi 3 has remote abilities including Wi-Fi and Bluetooth.

3.1.3. Buzzer

A Buzzer is a sound device that makes sound distributed to it. It will caution around the residents when the gas spilling happens. There are two central sorts of signals: Active and Passive. Active: An inert sign transmits a tone when a voltage is associated across over it. It moreover requires a specific banner to create a grouping of tones. The latent bell is altogether less hard to use, so these are made sure about here.

Passive: A working ringer can be related essentially like a LED. In any case, as they are to some degree progressively fiery, you won't require a resistor to make sure about them.

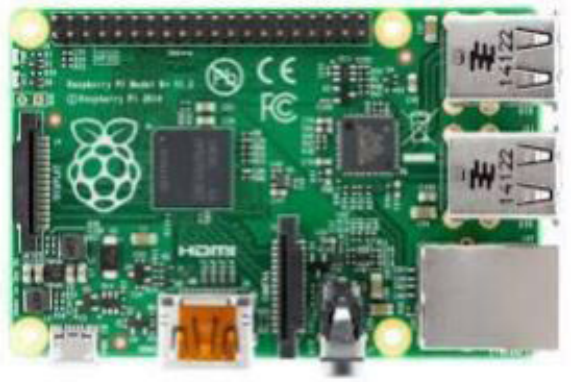

Fig. 1: Raspberry pi

Fig. 2: Buzzer

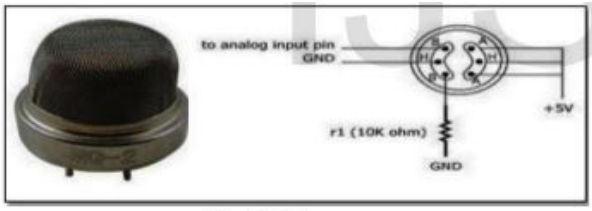

Fig. 3: MQ2 gas sensor.

Fig. 4: Graph on sensor output voltage Vs ppm.

3.1.4. MQ-2 Gas Sensor

The touchy material utilized in MQ-2 gas sensor is tin oxide (SnO2), which has lower conductivity in a perfect air medium. When the objective LPG spill is recognized, the sensor's conductivity rises and increments proportionately as the degree of gas spillage increments. The location scope of MQ-2 gas sensor is 300-5000 ppm[6] and has quick reaction time and is a low fueled gadget (5V).

3.1.5. Gas Sensor Calibration

The Calibration of MQ-2 gas sensor was done in a gas chamber utilizing a standard clinical syringe. The gas focus in ppm was fluctuated and relating yield voltages were noted. The voltage ranges for LPG gas fixation relating to different levels were estimated, and these are given in the accompanying Table 1.

The Fig. 4 infers that if the gas focus is expanded over the typical limit level (400ppm), the framework actuates and offers alarm to the client.

3.2. Software Requirements

3.2.1. XAMPP

XAMPP is open source, lightweight and basic Apache appropriation which assists with creating neighborhood web servers. XAMPP comprises of Apache ,MySQL,PHP and Perl(dynamic significant level programming language).

3.2.2. Python:

Python is significant level, intelligent, object situated programming language. It underlines code clarity and permits the client to communicate idea in less code lines [12]. Python has highlights like it is anything but difficult to learn, extensible, embeddable, convenient, free open-source and has huge standard libraries.

4. IMPLEMENTATION

The framework recognizes and continually screens in the event that it sees its focus as high for example gas spill, it utilizes its ready component to advise clients and The Fig. 4 infers that if the gas focus is expanded over the typical limit level (400ppm), the framework actuates and offers alarm to the client The Fig.4 infers that the framework actuates and offers alarm to the client bothered specialists. It likewise passes information to system's storage for investigation then forecast that will utilized in upcoming days.[7-10]

2010-2019 S-JPSET : Vol. 12, Issue Supplementary-1, ISSN : 2229-7111 (Print) and ISSN : 2454-5767 (Online)

That means associated with working of framework are as per the following:

1. The gadget will take encompassing gas as a contribution to identifying this gas we will utilize MQ2 Gas sensor.
2. Rating of gas in ppm will be sent to MCP3008 it will change over simple information into computerized information and it sends this information to Raspberry Pi.
3. Raspberry pi will be associated with MCP3008 and Raspberry pi resembles a smaller than normal Computer it has its own OS, RAM, Wi-Fi, Storage Like some other PC have.
4. Raspberry pi will process information and make a suitable move as per we have modified, for example, what pace of spillage ready message will be sent to the proprietor as indicated by the worth we have set and on the off chance inordinate Leakage naturally educate fire detachment about Leakage.
5. We will utilize VNC connector to interface the Raspberry pi to a PC or PC for programming.

The figure shows the framework viable as a solitary elevated level procedure and shows the framework's relationship with other outside elements.

4.1. Flow Diagrams

Figure 5 provides the overall structure to our application. It explains how hardware and user interact with the system.

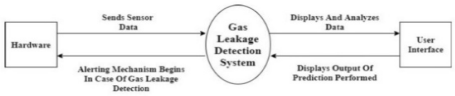

Fig. 5: Context level Diagram

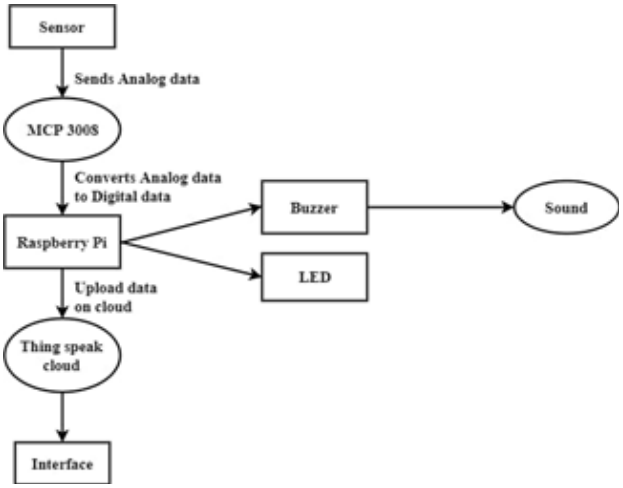

Fig. 6: Level 0 DFD

Fig. 6 explains how the system works. It shows how the sensor values through sensors are passed to the database and how specific user is fed with analyzed data and prediction.

5. RESULTS AND DISCUSSION

5.1. User Interface to Interact with Database:

The ordinary page has appeared to the client. It shows the sensor esteems put away in the database. It additionally

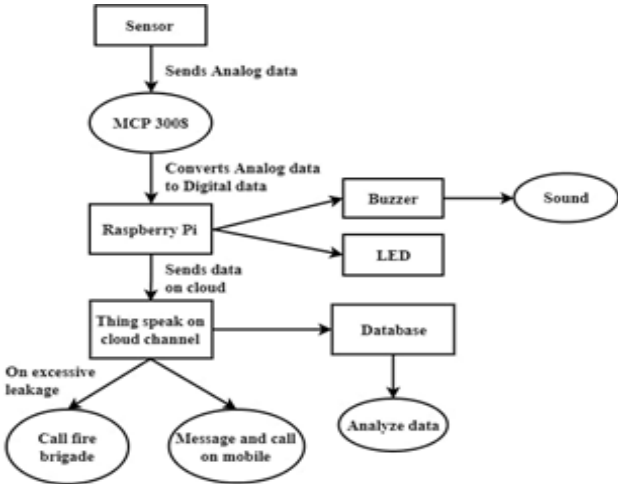

Fig. 7: Level 1 DFD

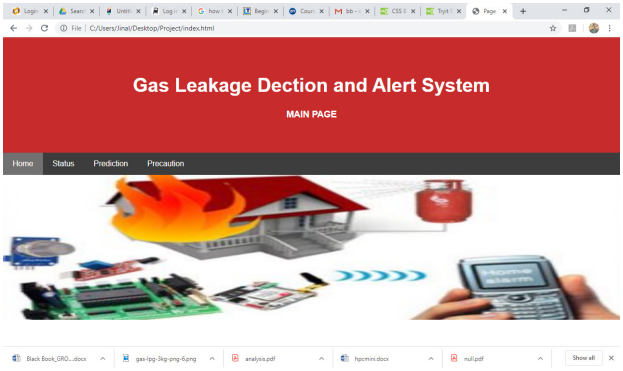

Fig. 8: User Interface

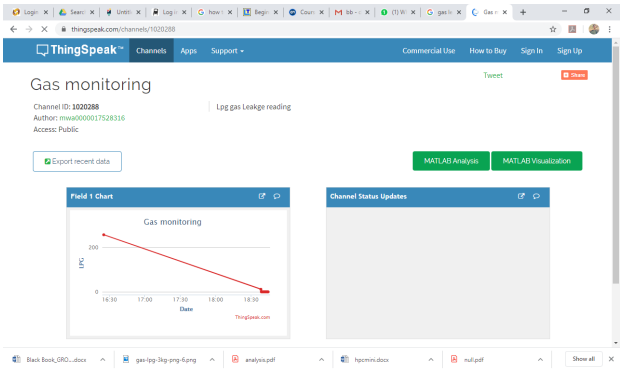

Fig. 9: UI shows on click information of gas leakage values data analysis.

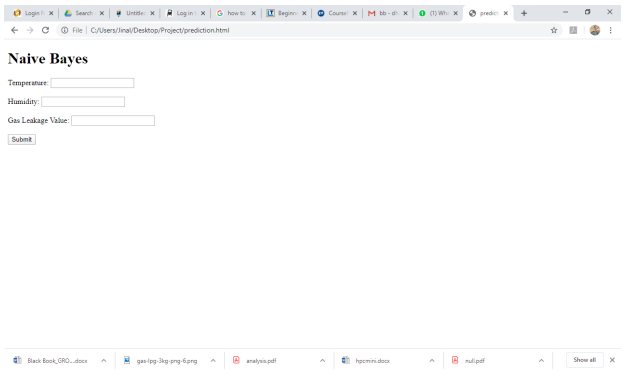

Fig. 10: UI shows gas leakage rate prediction for values provided by user.

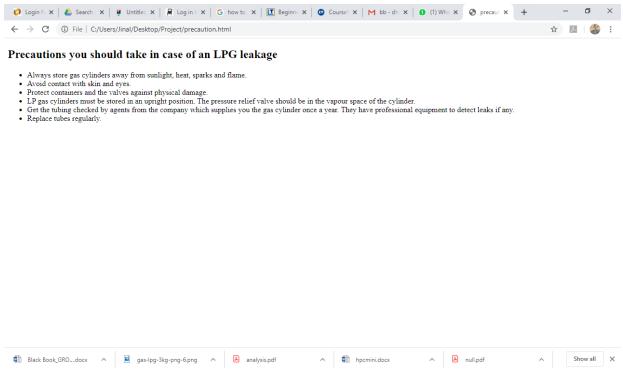

Fig. 11: UI shows on click guidelines for safety purpose.

shows the expectation to the client for the qualities entered by him.

5.2. Database analysis and prediction:

An investigation is finished utilizing charts utilizing the sensor esteems put away in a database. It shows the chart

Fig. 12: Prediction Output

Fig. 13: Gas Leakage Result

between gas focus and the temperature around then. The forecast should be possible utilizing Naive Bayes calculation. Innocent Bayes is a characterization system that helps for prescient issues.

5.3. Output for Gmail When Gas Is Detected:

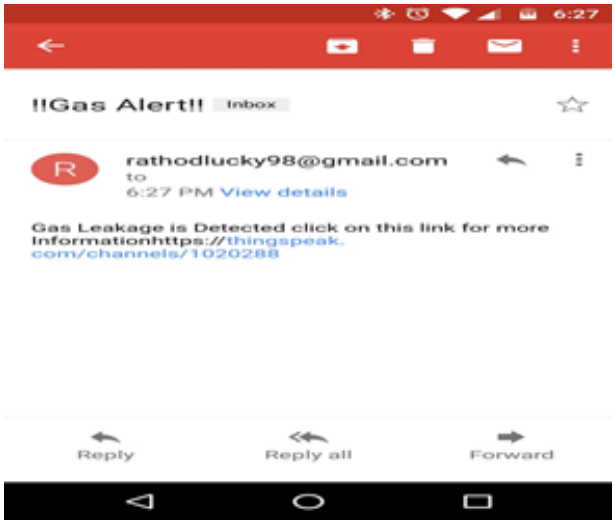

Fig. 14. Mail Output

5.4. Output for User Mobile When Gas is detected:

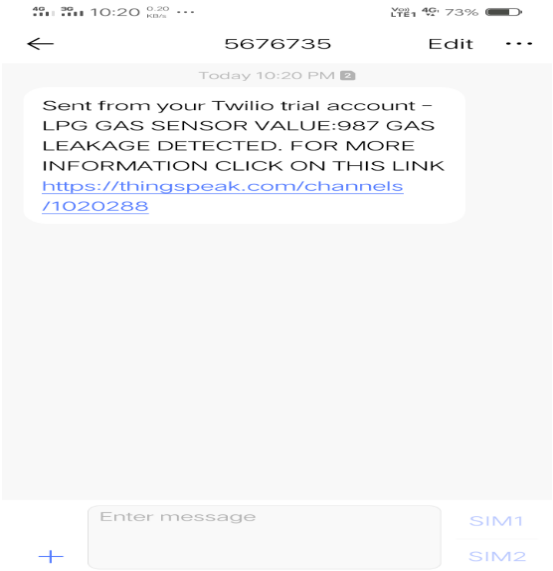

Fig. 15: SMS indication on user mobile phone.

5.5. Results

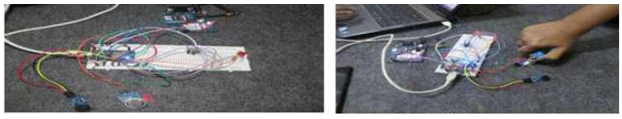

Fig. 16: Circuit Setup of Leakage Detection System

2010-2019 S-JPSET : Vol. 12, Issue Supplementary-1, ISSN : 2229-7111 (Print) and ISSN : 2454-5767 (Online)

6. CONCLUSION AND FUTURE SCOPE

In the future it very well may be actualized in enormous scope enterprises. This framework can be structured by utilizing all the more great sensors to identify precise values. The proposed machine won't simply offer security to the customers instead of dangerous gases yet break down the information saved in the system's storage to complete desires that may be required while contemporary. The utilization of IoT parts diminishes the price for device with more degree with motivation to make it significantly less excessive than the standard Gas locator systems. The device also educates the client and specific authority regarding spillage through the assistance of information provided by sms.[13-16]

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